

J. Pillischer, Swift and Son, and Watson and Sons.—Among the other objects exhibited may be mentioned typical species of Foraminifera selected from various localities by Mr. A. Earland, which were rare and beautiful; and mounted specimens of Hydrozoa, by Mr. G. E. Harris.

EDINBURGH.

Royal Society, December 19.—Lord Kelvin in the chair.—Mr. R. G. Alford read a paper on crane scaffoldings, their mathematical calculations and probable theoretical deficiencies. The paper was a comparison of two similar scaffoldings, one of which was overturned in a gale which the other resisted.—In a note on dew bows, Drs. Knott and Lundie gave an account of a system of brilliant "bows" produced at night on the ground, the source of light being the gas-lamp or electric light of the street. The phenomenon required the existence on the ground of a layer of numerous globules of water of nearly the same size and so small as to suffer little distortion from perfect sphericity. The globules were fog particles, which had gradually settled down in the still air of the last of four days of heavy fog. The curves formed by these dew bows are plane sections of a toroidal surface. Some of the curves were drawn on a black board by means of a simple but obvious kinematical model.—Lord Kelvin communicated a paper on the reflection and refraction of solitary plane waves at a plane interface between two isotropic elastic mediums, fluid, solid, or ether. The investigation presented certain novelties of treatment. One of these was the introduction of the condensational-rarefactional waves of reflection and refraction moving with slow velocities through the (contractile) ethers. (The four waves into which a wave of either type breaks up at the boundary of two elastic solids were first discussed by Knott in 1888, with special reference to earthquake waves.) Then there was the question of the total reflection of a solitary wave instead of a train of waves. And finally there was the application of the principle of the continuity of the rotational magnetic force at the interface. Fresnel's *sine* and *tangent* formulæ for the reflection of plane polarised rays followed at once.—Mr. Sydney A. Kay communicated a paper on the equilibrium between sulphuric acids and sulphates in aqueous solutions. The concentrations of the free acid, neutral sulphate, and acid sulphate in solutions containing sulphuric acid and a neutral sulphate were determined by means of a reaction velocity method—namely, by the catalysis of ethylic acetate. Then the degrees of dissociation in the three substances were calculated from Kohlrausch's later determinations of the electric conductivities at infinite dilution. Finally an expression for the equilibrium was developed as an empirical formula which, within the limits of the experiments, gave results in close agreement with observation. The formula was

$$\frac{\{\text{Conc. H}_2\text{SO}_4(1 - \alpha_1)\}^{0.85}}{\text{Conc. MHSO}_4(1 - \alpha_2)} = \frac{A}{\{\text{Conc. M}_2\text{SO}_4(1 - \alpha_2)\}^x}$$

where conc. means concentration, M is the symbol for the metal involved, $\alpha_1, \alpha_2, \alpha_3$ are the degrees of dissociation, A and x are constants with characteristic values for each case. Thus, when M is potassium, sodium or lithium, A has corresponding values 0.259, 0.0618, or 0.0600 respectively, and x has values 1, 1.35, 1.35 respectively.—Mr. David Robertson read a paper on dust figures of electrostatic lines of force. These were obtained by sprinkling the dust over a glass plate against the under surface of which were pressed electrodes in connection with a Wimshurst machine. The chief difficulty was to get a suitable substance; for the particles should be sufficiently conducting to be acted on inductively, and yet sufficiently insulating to prevent escape of the charges. Of the many kinds of dust tried, pure mahogany sawdust coloured with ink was found to be the most efficient. It was stated that the secret of getting good results lay in stopping the action of the machine at the right moment. Many interesting examples of the curves were exhibited.—In a note on the action of persulphates on iodine, Dr. Hugh Marshall drew attention to a reaction which seems to have been neglected by recent experimenters. When, for example, a solution of potassium iodide is being boiled with ammonium persulphate so as to decompose it and drive off the iodine by sublimation, the iodine in the liquid seems to disappear at a more rapid rate than corresponds to the amount volatilised. In fact, as was proved by direct experiment, the iodine is oxidised by the persulphate, and becomes iodic acid.—A paper by Prof. Anglin, on the

summation of the series whose n th terms are u_n and $1/u_n$ where u_n denotes

$$(an + b) \{a(n + 1) + b\} \{a(n + 2) + b\} \dots \{a(n + r - 1) + b\}$$

was also read.

PARIS.

Academy of Sciences, January 21.—M. van Tieghem in the chair.—On the estimation of phosphorus and sulphur in plants and their ashes, by M. Berthelot. Of the various methods suggested for determining sulphur and phosphorus in plants, burning in a stream of oxygen, and subsequently passing the gases over a long column of red-hot sodium carbonate, gave the highest results. Prolonged boiling with strong nitric acid or estimation after incineration showed large deficiencies in both sulphur and phosphorus.—On the presence and estimation of chlorine in plants, by M. Berthelot. Combustion with oxygen in presence of sodium carbonate gave higher results than a careful incineration in the ordinary way. An attempt was made to distinguish between the total chlorine and the chlorine existing in the plant in the form of chlorides, but without much success.—Preparation and properties of an organic ammonium, lithium—monomethylammonium, by M. Henri Moissan. Anhydrous methylamine reacts vigorously with lithium at temperatures near 0°C ., forming a blue solution similar to the alkaline ammoniums. The composition approximated to $\text{Li}(\text{CH}_3\text{NH}_2)$. In a vacuum this loses methylamine, and finally deposits brilliant crystals of metallic lithium, no gas being evolved.—Influences of metallic armatures upon the properties of mortars, by M. Considère.—Constitution of the ring of small planets, by M. Jean Mascart. Curves are given showing the distribution of longitudes of the nodes and perihelia of the asteroids for every 30° .—Observation of the total eclipse of the moon of December 27, 1898, made at the Observatory of Lyons, by M. Ch. André. The state of the sky interfered considerably with the observations.—Observations made at the Observatory of Toulouse during the eclipse of December 27, 1898, by MM. Baillaud, Bourget, Montangerand, Rossard, and Besson, by M. Baillaud. Ten photographs were successfully taken during the eclipse.—Observations of the Brooks comet (October 1898) and Chase comet, made at the Observatory of Toulouse with the Brunner equatorial, by M. F. Rossard.—On the propagation of liquid waves through water, by M. Georges Poisson.—On the absorption of light by a body placed in a magnetic field, by M. Auguste Righi. When such gases as nitrogen peroxide, iodine, iodine monobromide, iodine monochloride, or selenium tetrabromide of suitable concentration are placed in the path of a ray of light in a strong magnetic field, a distinct change in the colour of the transmitted light is noticeable when the electromagnetic circuit is completed.—On a simple form of magnetometer, by M. A. Guillet. Two diagrams of the apparatus are given, together with the theory of the instrument, but no actual measurements are cited.—General method of separation of chlorine, bromine and iodine in the form of silver salts, by M. H. Baubigny. The dry silver salts are treated with sulphuric acid containing bichromate, the chlorine and bromine distilled off into potash containing sulphite, and these separated by the use of potassium permanganate and copper sulphate. The two test analyses given are very satisfactory.—On the formation of the head of the Hymenoptera, by M. L. G. Seurat. The head is formed uniquely from the head of the larva; at first invaginated, this head, by a movement of rotation in the median plane, becomes devaginated and acquires its final form.—A transverse section of the Briançon Alps, from Gironde to the Italian frontier, by MM. Kilian and Lugeon.—Ostioles in the animal and vegetable kingdoms considered as a regulating apparatus, by M. J. J. Andler.

DIARY OF SOCIETIES.

THURSDAY, JANUARY 12.

MATHEMATICAL SOCIETY, at 8.—On a Determinant each of whose Elements is the product of k Factors: Prof. W. H. Metzler.—Properties of Hyper-space, in relation to Systems of Forces, the Kinematics of Rigid Bodies, and Clifford's Parallels: A. N. Whitehead.—A Simple Method of Factorising Large Composite Numbers of any unknown form: D. Biddle.—Zeros of the Bessel Functions (second paper): H. M. MacDonald.—Linear Substitutions and Inversions: Dr. G. G. Morrice.—On the Reduction of a Linear Substitution to its Canonical Form: Prof. Burnside, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.

FRIDAY, JANUARY 13.

ROYAL ASTRONOMICAL SOCIETY, at 8.—A Suggestion for the Explanation of Stationary Radiant Points of Meteors : Prof. H. H. Turner.—Remarks on Prof. Turner's Paper, with another Suggested Explanation of Stationary Radiant Points of Meteors : Prof. A. S. Herschel.—Observations of the Leonids, November 1898 : Observatory, Perth, West Australia.—On the Value of Possible Observations from Free Balloons : Rev. J. M. Bacon.—Note on Dr. Gill's paper "On a New Instrument for Measuring Astrophotographic Plates : Prof. H. H. Turner.—Note on Mr. Espin's Object in *Perseus* : C. D. Perrine.—Eclipse of the Moon, December 27, 1898 : Rev. W. Sidgreaves.—The Great Sun-spot of September 1898 : W. H. Robinson.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Application of the Science of Mechanics to Engineering Practice : Dr. Archibald Barr.

MALACOLOGICAL SOCIETY, at 8.—Notes on the Anatomy of some Snails (*Trachycystis*, *Dorcasia* and *Isomeria*) : W. Moss and W. Mark Webb.—Illustrations of, with Notes on, some Non-Marine Hawaiian Molluscs : E. R. Sykes.—Description of New Non-Marine Molluscs from the Hawaiian Islands : C. F. Ancey.—Note on *Voluta Roadknights* : Agnes Kenyon.

MONDAY, JANUARY 16.

SOCIETY OF ARTS, at 8.—Bacterial Purification of Sewage : Dr. Samuel Rideal.

IMPERIAL INSTITUTE, at 8.30.—Personal Experiences in China : Rev. Gilbert Reid.

VICTORIA INSTITUTE, at 4.30.—Glacial Action in the Southern Hemisphere.

TUESDAY, JANUARY 17.

ROYAL INSTITUTION, at 3.—Morphology of the Mollusca : Prof. E. Ray Lankester, F.R.S.

ZOOLOGICAL SOCIETY, at 8.30.—General Account of his Zoological Expedition to the South Seas : Dr. Arthur Willey.—On the Characteristic Points in the Cranial Osteology of the Parrots : Prof. D'Arcy W. Thompson, C.B.—Report on the Gorgonacean Corals collected by Mr. J. Stanley Gardiner at Funafuti : Miss Isa L. Hiles.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Effects of Wear upon Steel Rails : William G. Kirkaldy.—On the Microphotography of Steel Rails : Sir William C. Roberts-Austen, K.C.B., F.R.S.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—On some New Half-tone Screens of English Manufacture : J. E. Johnson.

ROYAL STATISTICAL SOCIETY, at 5.

WEDNESDAY, JANUARY 18.

SOCIETY OF ARTS, at 8.—Canals and Inland Navigation in the United Kingdom : L. F. Vernon Harcourt.

GEOLOGICAL SOCIETY, at 8.—Felsitic Lavas and Tufts near Conway (North Wales) : Frank Rutley.—The Geology of Southern Morocco and the Atlas Mountains : the late J. Thomson.

ROYAL METEOROLOGICAL SOCIETY, at 7.45.—Annual General Meeting.—Address by the President (Mr. F. C. Bayard), on the Government Meteorological Organisations in various parts of the World.

ROYAL MICROSCOPICAL SOCIETY, at 8.—Annual Presidential Address.

ENTOMOLOGICAL SOCIETY, at 8.—Annual Meeting.—Address by the President, Mr. Roland Trimen, F.R.S.

THURSDAY, JANUARY 19.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Observations upon the Normal and Pathological Histology and Bacteriology of the Oyster : Prof. Herdman, F.R.S., and Prof. R. Boyce.—On the Formation of Multiple Images in the Normal Eye : S. Bidwell, F.R.S.—On the Vibrations in the Field round a Theoretical Hertzian Oscillator : Prof. K. Pearson, F.R.S., and Miss Lee.—On the Refractive Indices and Densities of Normal and Semi-normal Aqueous Solutions of Hydrogen Chloride, and the Chlorides of the Alkalies : Sir J. Conroy, F.R.S.

ROYAL INSTITUTION, at 3.—Tibet and the Tibetans : A. H. Savage Landor.

SOCIETY OF ARTS (Indian Section), at 4.30.—Railways in Burma, and their proposed Extension across Yunnan : J. Nisbet.

LINNEAN SOCIETY, at 8.—New Peridiniaceae from the Atlantic : G. R. Murray, F.R.S., and Miss F. G. Whitting.—On the Structure of *Lepidostrobilus* : Arthur J. Maslen.—Some Observations on the Caudal Diplospondyli of Sharks : Dr. W. G. Ridewood.

CHEMICAL SOCIETY, at 8.—Researches on Moorland Waters. I. Acidity : W. Ackroyd.—a-ketotetrahydronaphthalene : Prof. F. S. Kipping, F.R.S., and Alfred Hill.—A New Method for preparing *as*-dimethyl- and Trimethyl-succinic Acids : William A. Bone.—Reduction of Optically-active Mono- and Di-alkyloxysuccinic Acids from Malic and Tartaric Acids : Prof. Thomas Purdie, F.R.S., and William Pitheathly.—Action of Ammonia on Ethereal Salts of Organic Bases : Dr. Siegfried Ruhemann.—Esterification Constants of Substituted Acetic Acids : Dr. J. J. Sudborough and Lorenzo L. Lloyd.—Di-ortho-substituted Benzoic Acids. Part IV. Formation of Salts from Di-ortho-substituted Benzoic Acids and different Organic Bases : Lorenzo L. Lloyd and Dr. J. J. Sudborough.—The Thermal Effects of Dilution : J. Holmes Pollok.—The Changes of Volume due to Dilution of Aqueous Solutions : F. B. H. Wade.

FRIDAY, JANUARY 20.

ROYAL INSTITUTION, at 9.—Liquid Hydrogen : Prof. J. Dewar, F.R.S.

EPIDEMIOLOGICAL SOCIETY, at 8.30.—Epidemic Cerebro-spinal Meningitis : Dr. Bruce Low.

QUEKETT MICROSCOPICAL CLUB, at 8.

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BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Results of Rain, River and Evaporation Observations made in New South Wales during 1897 : H. C. Russell (Sydney).—Iowa Geological Survey Annual Report, 1897, &c. (Des Moines).—The Last Link : E. Haeckel (Black).—Annual Report of the Smithsonian Institution, to July 1896 (Washington).—Geographical Journal, Vol. xii. (Stanford).—Notes from a Diary in Asiatic Turkey : Lord Warkworth (Arnold).—The History of Mankind : Prof. F. Ratzel, translated, 3 Vols. (Macmillan).—The Swastika : T. Wilson (Wesley).—Mathematical and Physical Tables : J. P. Wrapson and W. W. H. Gee (Macmillan).—Bush Fruits : Prof. F. W. Card (Macmillan).—Elementary Mathematics : J. L. S. Hatton and G. Bool (Whittaker).—Studien über Hirsche : Dr. H. Nitsche, Heft 1 (Leipzig, Engelmann).—Grundriss einer Geschichte der Naturwissenschaften : Dr. F. Dannemann, ii. Band (Leipzig, Engelmann).—Maryland Geological Survey, Vol. 2 (Baltimore).—The Geology of the Isle of Purbeck and Weymouth : A. Strahan (London).

PAMPHLETS.—A Course of Lectures on Mining. I. The South Wales Coal-field : Prof. W. Galloway (Cardiff).—The Gypsum Boulder of Great Crosby : T. M. Reade (Liverpool).

SERIALS.—Journal of Botany, January (West).—Middlesex Hospital Journal, December (London).—Journal of the Royal Agricultural Society, December (Murray).—Journal of the Royal Statistical Society, December (Stanford).—Reliquary and Illustrated Archaeologist, January (Benrose).—Zeitschrift für Physikalische Chemie, xxvii. Band, 4 Heft (Leipzig).—Transactions of the Wagner Free Institute of Science of Philadelphia, April (Philadelphia).—Observatory, January (Taylor).—Scribner's Magazine, January (Low).—Geographical Journal, January (Stanford).—Knowledge, January (Wetherby).—Journal of Anatomy and Physiology, January (Griffin).—Engineering Magazine, January (222 Strand).—Photogram, January (Dawbarn).—Monthly Weather Review, September (Washington).—Annuario Storico Meteorologico Italiano, Vol. 1, 1898 (Torino).—Mind, January (Williams).—Zeitschrift für Wissenschaftliche Zoologie, lxx. Band, 2 Heft (Leipzig).—Botanische Jahrbücher, Fünfundzwanzigster Band, 5 Heft (Leipzig).—Atlantic Monthly, January (Gay).—Imperial University, College of Agriculture, Bulletin, Vol. iii. No. 5 (Komaba).

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